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ABSTRACT

The acquisition of imitative responses without reinforcement was investigated with infants by eliminating contingent reinforcement through the use of videotaped models. Twenty-nine male and female infants were randomly assigned to one of two groups, a Rhythmic Vocalization Group or a Conversation Control Group. Infants in the first group were shown a videotape of an adult female model repeating a novel phoneme in a sequence of sounds and pauses. Infants in the second group were shown a 10-minute videotape of a conversation in a daytime television drama. Trained observers behind a one-way vision mirror scored the frequency and duration of six types of behavior, including vocalization of the novel phoneme. Two types of data analyses were performed: a 2 (Treatment Group) X 2 (Sex of subject) X 3 (Repeated Sessions) analysis of variance, and an event sequential analysis to determine whether observed vocalizations at any lag significantly exceeded expectation. The general findings were: (1) no infant in the study imitated the novel phoneme or repeated the precise phoneme pattern; (2) data from the sequential analysis indicated evidence for imitation of the rhythmic component of the phoneme pattern; and (3) the type of stimulus presented had differential effects on males and females. Although there were no differences at pretest, following treatment males increased their vocalizations in response to the conversation videotape while females decreased their vocalizations. (Author/SS)

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Imitation as a Skill in Infancy

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Imitation as a Skill in Infancy

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Over forty years ago Valentine (1930) made the following observation on imitation: "The psychology of imitation is in a somewhat chaotic state, partly owing to the ambiguity of the term and partly owing to disagreement as to facts." More recently, Aronfreed (1969) has suggested that this statement may be equally true today. Social learning and operant learning theorists have differed in their view of the environmental influence on imitative behaviors. Generalized imitation, as proposed by operant learning theorists (e.g., Lovaas, 1967), is a class of responses controlled by contingencies in the environment. Social learning theorists maintain that reinforcement is entirely unnecessary (e.g., Bandura and Walters, 1962) and animal researchers have suggested that the cue rather than the reinforcer controls the response (Bolles, 1971). The purpose of this study was to examine the acquisition of an imitative response eliminating contingent reinforcement. One way of controlling contingent reinforcement is through videotaped exposure. In pilot work we found that a female model repeating the phoneme /ba/ several times to an infant could not control her feedback to the infant. For example, when the infant mimicked the model, the model could not always maintain a constant facial expression or always avoid eye contact with the infant. Through videotaped presentations we eliminated contingent feedback from the model.

Our first hypothesis was that infants would imitate the novel phoneme. Other research has shown that infants at six months do not have the phoneme /ba/ in their repertorie. Our second hypothesis was that infants would

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We would like to acknowledge the contributions of Ken Kaye, Bev Davis, Wendy Shelton, and Lynn Davis throughout this research.

imitate the more general rhythmic component of the vocalization pattern made when repeating the phoneme. Evidence for this hypothesis would be a sequence of sounds coming back-to-back with a similar number of sounds occurring as were presented in the pattern. In pilot work we noticed that infants often duplicated rhythmic components ignoring what we thought were the more salient cues suggesting that they were attending to this component in our presentations.

Our data indicate that there is support for the second hypothesis. General imitation of the rhythmic pattern did occur and persisted at least 24 hours. I will describe to you how we came to this result.

Method

Subjects

Subjects were 16 male (M age = 199 days) and 16 female (M age = 195 days) infants selected from birth notices in a Seattle newspaper. Only infants whose mothers reported normal, full-term pregnancies, normal births, and healthy infants were considered for participation. Infants of each sex were randomly assigned to one of two groups. For three of the 32 infants the data were incomplete since these infants did not complete all parts of the study.

Procedure

The two groups were a Rhythmic Vocalization Group and a Conversation Control Group. Infants in the Rhythmic Vocalization Group were seated on their mothers' laps and presented a videotape of an adult female model repeating the phoneme /ba/ four times with rising intonation followed by a 7 second pause. The entire pattern was repeated 10 times before a longer 30 second pause intervened. This sequence of sounds, pauses, and a long pause was then repeated for 10 minutes. Thus, the infant heard /ba-ba-ba-ba/ a number of times over the 10 minute trial. Infants in the Conversation Control Group were similarly presented a standard 10 minute videotape

of a daytime television drama, Return to Peyton Place, in which several male and female adults carried on a conversation. Both groups of infants were observed through a one-way vision mirror for five minutes each during pretest, treatment, and posttest taken 24 hours later. Frequency and duration measures were scored by trained observers using a behavioral code on an electronic digital data acquistion system (Sackett, Stephenson, and Ruppenthal, 1973). The behavioral code contained categories for /ba/, distinct vocalizations, head movements, arm movements, other gross body movements, and a "no behavior" category. Detailed descriptions of setting, scoring procedures, and observer reliability are reported elsewhere (Hollenbeck, 1975; Hollenbeck and Slaby, 1974). Between and within observer reliability were maintained at an average of greater than 90 percent agreement.

Results

A 2 (Treatment Group) X 2 (Sex of Subject) X 3 (Repeated Sessions) mixed design harmonic means analysis of variance was performed on frequency and duration measures. For frequency, the analysis revealed a significant interaction of Sex of Subject by Sessions, F (2,50) = 3.64, $p < .05$; and a significant three-way interaction of Treatment Group by Sex of Subject by Sessions, F (2,50) = 3.58, $p < .05$; this interaction was also marginally significant for duration, F (2,50) = 3.06, $p < .10$. Subsequent t tests revealed no difference between Sexes at pretest or during treatment (See Fig. 1). However, at posttest, males produced significantly more total vocalizations (M = 23.34) than females (M = 11.19), ($p < .05$). Similarly, the total time spent vocalizing during posttest was significantly longer for males (M = 36.51 seconds) than for females (M = 17.79 seconds), ($P < .05$).

These results are modified when group membership is considered. Overall differences are accounted for by those males in the Conversation Control Group. There was no difference between groups at pretest. However,

males in the Conversation Group produced the fewest vocalizations ($\underline{M}$ = 7.98) during treatment and the most ($\underline{M}$ = 32.81) during the posttest (See Fig. 1-A). On the other hand, males in the Rhythmic Vocalization Group did show a non-significant decrease in vocalizations from pretest to posttest while the males in the Conversation Group showed a non-significant increase. However, the posttest difference between males in the Rhythmic and Conversation groups was marginally significant ($p < .10$). In contrast, the females in

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Insert Fig. 1 About Here.

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the Rhythmic Group showed a non-significant increase in vocalizations from pretest to posttest while those in the Conversation Group showed a marginally significant decrease ($p < .10$), (See Fig. 1-B). Again, the posttest difference between Rhythmic and Conversation groups was marginally significant ($p < .10$).

The second analysis, an event sequential analysis (Sackett, 1974), was performed on the observational data to determine sequential dependencies among behavioral responses. The specific conditional probabilities examined took the form: Given the occurrence of any vocalization what is the probability that the next behavior will also be a vocalization? Similarly, conditional probabilities were examined for events occurring two through 10 behaviors (lags) away. The expected probability was calculated based on the total vocalizations in any test session. For example, if vocalizations accounted for 10 out of 100 behaviors in a session then the expected probability for vocalizations would equal .10. We simply asked if observed vocalizations at any lag significantly exceeded expectation. Figure 2 presents $\underline{t}$ test results for differences between pretest and

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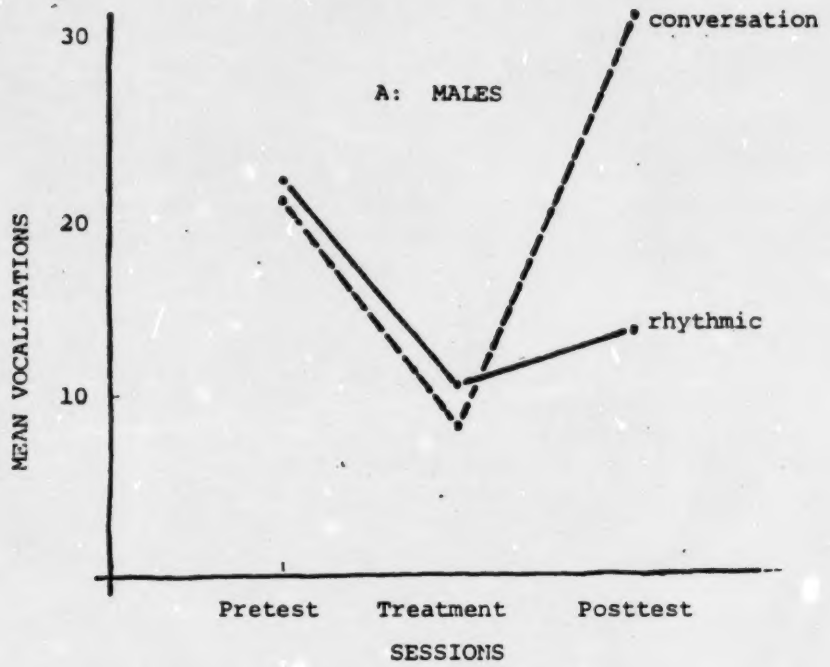
Insert Fig. 2 About Here.



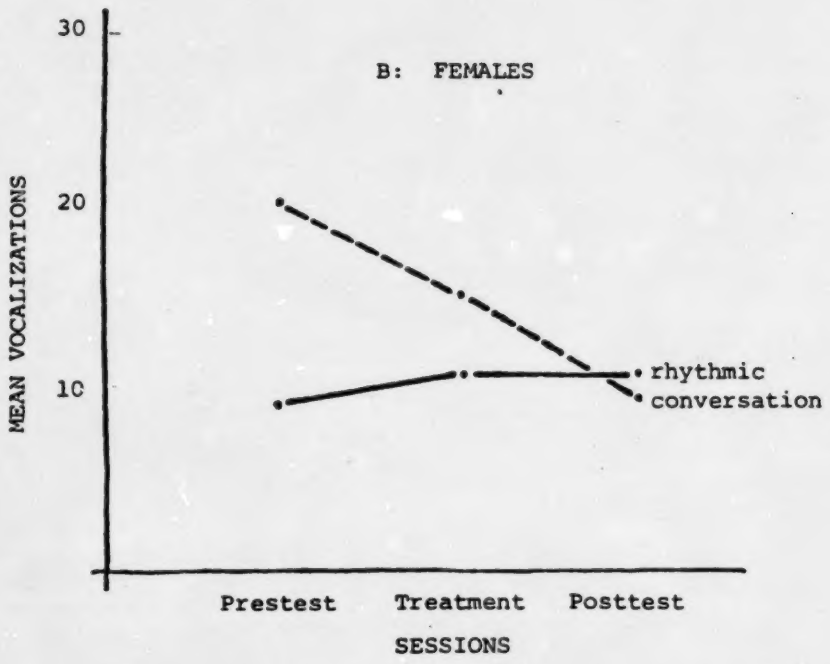


Fig. 1: Mean Number of Vocalizations per Session for Males (A) and Females (B)

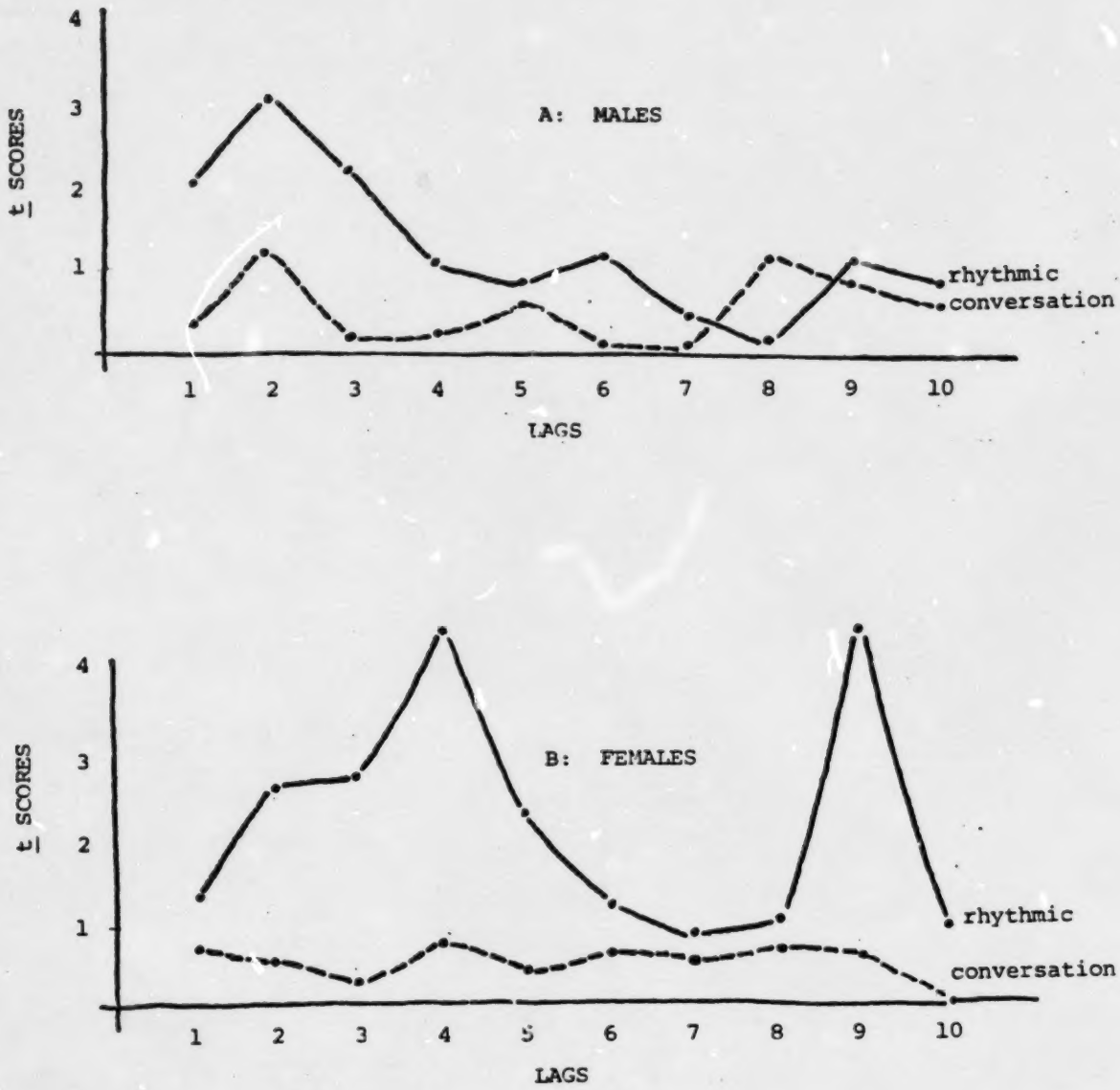


Fig. 2: Rhythmic and Conversation Difference Scores for Males (A) and Females (B)

posttest at each of 10 lags plotted for each group by sex. These scores represent a *t* difference from pretest to posttest in the probability that a vocalization will be followed at the given lag by another vocalization. The five percent significance level for 7 degrees of freedom is at 2.365 on these graphs for a two-tailed test. Males in the Rhythmic Group showed a significant increase in vocalizations following a vocalization. The typical pattern for males, then, was four vocalizations repeated in sequence. Females showed a slightly different pattern with another behavior intervening before four vocalizations occurred in sequence. Both males and females in the Conversation Group showed no difference between pretest and posttest (dotted lines). These data clearly indicate the high probability of four repeated vocalizations in sequence for both males and females in the Rhythmic Group.

Discussion

No infant in this study imitated the phoneme /ba/ or repeated the precise phoneme pattern. Thus, Hypothesis 1 for specific imitation was not supported either because of a failure to imitate or the phoneme was beyond the capabilities of the infants. However, at least two positive findings emerged from these results. First, evidence for imitation of the rhythmic component of the phoneme pattern was identified, supporting Hypothesis 2. Second, an unpredicted sex-difference was discovered. The type of stimulus presented had differential effects on males and females.

Perhaps the most interesting finding of this study is the evidence for imitation of a rhythmic vocalization pattern for both males and females. Imitation as an explanation for language acquisition is presently not a popular position. Psycholinguists have commonly argued that the process of imitation in language acquisition is not an important component (e.g., McNeill, 1970). Evidence for their position is based on

observational (Brown, 1965) as well as experimental work with children. However, Slobin (1968), in re-analyzing some of Roger Brown's early data, has suggested that imitation as an explanation was abandoned too hastily. The fact that infants can discriminate subtle acoustic cues has been well documented (e.g., Friedlander, 1970; Eimas, Siqueland, Jusczyk, and Vigorito, 1971). Our evidence indicates that infants can imitate a model's subtle rhythmic vocalization pattern as well. Most researchers have ignored the importance of rhythmic patterns when studying imitation and instead focused on the content of the speech (Ervin, 1964). Piaget (1969), however, has emphasized the importance of rhythm and pointed out its function in development. He suggests that, "rhythm characterizes the functions that are at the junction between organic and mental life, . . . rhythm is likewise at the root of all effector functions including those that constitute motor habit." Indeed, models of language acquisition which ignore the imitation of basic language rhythms must be reconsidered.

The second finding of sex differential responding to the conversation videotape is also interesting. Although there were no differences at pretest, following treatment males increased their vocalizations in response to the conversation videotape while females decreased their vocalizations. This leads us to question how and why daytime television would effect males and females differently. Unfortunately, we have no simple or even complex explanations of why this occurred. At the very least, however, we have demonstrated that non-contingent modeling can differentially elicit or inhibit vocalizations in male and female infants.

If we look at total duration of vocalizations instead of frequency, a similar pattern emerged. The means contributing to the triple interaction showed corresponding increases and decreases for each group by sex. Kagan (1969) reported an increase in duration of total vocalizations for

males and females as a measure of attention toward photographs of faces. The present study yielded almost twice the total duration of vocalizations for males while females vocalized only slightly less than the females in Kagan's study. This finding for increased male vocalization conflicts with several previous studies reported in Maccoby and Jacklin (1974) which showed that females vocalized more during free play (Lewis, 1972) and responded more vocally to mothers' behavior (Lewis and Freedle, 1972). However, as Maccoby and Jacklin suggest, "the presumed advantage of girls in the first two years of life is tenuous." We would add the further qualification that generalizations between laboratories and across stimulus elicitors is just as tenuous.

In summary, six-month-old infants were able to imitate the general rhythmic component of a repeating phoneme pattern. Futhermore, males and females responded differentially to the two videotaped presentations. Thus, the extent that television is used as an informal "baby-sitter" becomes a practical issue in terms of early language acquisition and sex differential experiences.

References

Aronfreed, J. The problem of imitation. In Lipsett, L. & Reese, H. (Eds.), Advances in child development and behavior. New York: Academic Press, 1969.

Bandura, A. & Walters, R.H. Social learning and personality development. New York: Holt, Rinehart & Winston, 1963.

Bollen, R.C. Reinforcement, expectancy, and learning. Unpublished manuscript, University of Washington, Seattle, 1971.

Eimas, P.D., Siqueland, E.R., Jusczyk, P. & Vigoritto, J. Speech perception in infants. Science, 1971, 171, 303-306.

Ervin, S. Imitation and structural change in children's language. In Lenneberg, E.H. (Ed.), New directions in the study of language. Cambridge: MIT Press, 1964.

Friedlander, B.Z. Receptive language development in infancy: issues and problems. Merrill-Palmer Quarterly, 1970, 15, 7-51.

Hollenbeck, A.R. & Slaby, R.G. Measures of reliability in behavioral observation: the advantage of "real-time" data acquisition. Paper presented at the meetings of the American Psychological Association, New Orleans, 1974.

Hollenbeck, A.R. Imitation as a skill in young infants. Under editorial review.

Kagan, J.S. Continuity in cognitive development during the first year. Merrill-Palmer Quarterly, 1969, 15, 101-119.

Lewis, M. Infants' responses to facial stimuli during the first year of life. Developmental Psychology, 1969, 1, 75-86.

Lewis, M. & Freedle, R. Mother-infant dyad: the cradle of meaning. Paper presented at a Symposium on Language and Thought: Communication and Affect, Erindale College, University of Toronto, March 1972.

Lovaas, O.I. Behavior therapy approach to treatment of childhood schizophrenia. Minnesota symposium on child development. Minneapolis: University of Minnesota Press, 1967.

Maccoby, E.E. & Jacklin, C.N. The psychology of sex differences. Stanford: Stanford University Press, 1974.

McNeill, D. The acquisition of language: the study of developmental psycholinguistics. New York: Harper & Row, 1970.

Piaget, J. Psychology of intelligence. Totowa: Littlefield, Adams & Co., 1969.

Sackett, G., Stephenson, E. & Ruppenthal, G. Digital data acquisition systems for observing behaviour in laboratory and field settings. Behavioral Research Methodology and Instrumentation, 1973, 5(4), 344-348.

Sackett, G. A nonparametric lag sequential analysis for studying dependency among responses in laboratory and field settings. Unpublished manuscript, University of Washington, Seattle, 1974.

Slobin, D. Imitation and grammatical development in children. In Endler, N., Boulter, L. & Osser, H. (Eds.), Contemporary issues in developmental psychology. New York: Holt, Rinehart & Winston, 1968.

Valentine, C.W. The psychology of imitation with special reference to early childhood. British Journal of Psychology, 1930, 21, 105-132.